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NASA-08331 (June 2003)  
NATIONAL AERONAUTICS NASA  
AND SPACE ADMINISTRATION SUPERSEDING NASA-08331  
(March 2002)  
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DIVISION 08 - DOORS AND WINDOWS

SECTION 08331

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06/03

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NATIONAL AERONAUTICS  
AND SPACE ADMINISTRATION  
NASA-08331 (June 2003)  
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SECTION 08331

OVERHEAD COILING DOORS  
06/03

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NOTE: Delete, revise, or add to the text in this  
section to cover project requirements. Notes are  
for designer information and will not appear in the  
final project specification.

This section covers manually-operated and  
power-operated overhead coiling doors.

Drawings must indicate door location, opening  
dimensions, wall thickness, sideroom and headroom  
clearances, structural framing above the door track,  
jamb conditions, location and type of electrical  
service, and remote-control stations. See  
limitation on the use of revolving doors in NFPA  
101, chapter 5, section 2.1.3.2.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: The following references should not be  
manually edited except to add new references.  
References not used in the text will automatically  
be deleted from this section of the project  
specification.

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The publications listed below form a part of this section to the extent  
referenced:

AMERICAN WOOD PRESERVERS BUREAU (AWPB)

AWPB LP 2	(1988) Softwood Lumber, Timber and Plywood Pressure Treated with Water-Borne Preservatives for Aboveground Use
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ASME INTERNATIONAL (ASME)

ASME B29.11M (1984) Combination Chains, Attachments and Sprocket Teeth

ASME B29.1M (1993) Precision Power Transmission Roller Chains, Attachments, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A 153/A 153M (2001a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 27/A 27M (2000) Standard Specification for Steel Castings, Carbon, for General Application

ASTM A 307 (2000) Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

ASTM A 36/A 36M (2001) Standard Specification for Carbon Structural Steel

ASTM A 446/A 446M (1993) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 48 (1994; Rev A) Standard Specification for Gray Iron Castings

ASTM A 48M (1994; Rev A) Standard Specification for Gray Iron Castings (Metric)

ASTM A 525 (1993) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

ASTM A 525M (1991; Rev A) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process (Metric)

ASTM A 526/A 526M (1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality

ASTM A 53 (1999; Rev B) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 780 (1993) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip

#### Galvanized Coatings

ASTM D 2000	(2001) Standard Classification System for Rubber Products in Automotive Applications
ASTM E 152	(1981; Rev A) Standard Methods of Fire Tests of Door Assemblies
ASTM F 568M	(1998) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

#### NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA MG 1	(1998) Motors and Generators
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#### NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993) Enclosures for Industrial Control and Systems
NEMA ST 1	(1988) Specialty Transformers (Except General Purpose Type)

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(1992) Standard for Fire Doors and Fire Windows
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#### U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS FF-B-171	(Rev A; Am 1) Bearings, Ball, Annular (General Purpose)
FS TT-C-490	(Rev C; Am 2) Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings
FS TT-W-571	(Rev J) Wood Preservation: Treating Practices

#### UNDERWRITERS LABORATORIES (UL)

UL 674	(1994; 3rd Ed) UL Standard for Safety Electric Motors and Generators for Use in Hazardous (Classified) Locations
UL Bld Mat Dir	(1999) Building Materials Directory

### 1.2 PERFORMANCE REQUIREMENTS

#### 1.2.1 Wind Loading

Doors shall be designed and reinforced to withstand a wind loading pressure

of at least [\_\_\_\_\_] pounds per square foot kilopascal with a maximum deflection of 1/120 of the opening width.

#### 1.2.2 Fire Doors, Frames, and Hardware

Fire doors, frames, and hardware shall be types that have been fire tested, rated, and labeled in accordance with ASTM E 152. They shall bear metal UL labels as evidence of the rating. Labels shall indicate the rating in hours of duration of exposure to fire, with a letter following the hourly rating to designate the location for which the assembly is designed and the temperature rise on the unexposed face of the door at the end of 30 minutes of fire exposure.

Door frames shall bear the UL label: "Listed Fire Door Frame." Special frames constructed of materials other than steel and intended for use with doors rated at less than 3 hours shall bear a UL label indicating the hourly rating.

Metal UL labels shall be attached to each item of hardware in accordance with requirements specified in the UL Bld Mat Dir.

#### 1.2.3 Oversized Rolling Fire Doors

Where fire doors and frames exceed the size for which testing and labeling services are offered, certificates of inspection from the UL shall be furnished. Certificates shall state that except for size, doors, frames, and hardware are identical in design, materials, and construction to a door that has been tested and rated by the UL.

#### 1.3 SUBMITTALS

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**NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.**

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The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

##### SD-02 Shop Drawings

Fabrication drawings shall show complete assembly with hardware and framing details for the following items:

Overhead Coiling Doors  
Counterbalancing Mechanism  
Manual Door Operators

#### Electric Door Operators

Installation Drawings shall be submitted in accordance with paragraph entitled, "Overhead Coiling Door Assemblies," of this section.

#### SD-03 Product Data

Manufacturer's catalog data for the following items shall be submitted listing all accessories including supports, locks and latches, and weatherstripping.

Overhead Coiling Doors  
Hardware  
Counterbalancing Mechanism  
Manual Door Operators  
Electric Door Operators  
Fire-Rated Doors

#### SD-05 Design Data

Equipment and performance data for the following items shall be submitted in accordance with the paragraph entitled, "Performance Requirements," of this section.

Overhead Coiling Doors  
Hardware  
Counterbalancing Mechanism  
Manual Door Operators  
Electric Door Operators  
Fire-Rated Doors

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals for Overhead Coiling Door Assemblies shall be submitted.

### 1.4 FIELD MEASUREMENTS

Field measurements shall be taken prior to preparation of drawings and fabrication.

### 1.5 WARRANTY

Contractor shall furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship and that they will remain so for not less than [\_\_\_\_\_] years after completion and acceptance of the project.

Contractor shall warrant that upon notification by the Government, he will immediately make good any defects in material, workmanship, and door operation within the same time period covered by the guarantee, at no cost to the Government.

## 1.6 OVERHEAD COILING DOOR ASSEMBLIES

Installation Drawings for overhead coiling door assemblies shall show rough frame opening dimensions, hardware and anchor locations, and counterbalancing mechanism and door operator details.

Contractor shall submit [6] [\_\_\_\_\_] copies of the Operation and Maintenance Manuals 30 days prior to testing the Overhead Coiling Door Assemblies. Data shall be updated and resubmitted for final approval no later than 30 days prior to contract completion.

Operation and maintenance manuals shall be consistent with manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Test data shall be legible and of good quality.

## PART 2 PRODUCTS

### 2.1 OVERHEAD COILING DOORS

#### 2.1.1 Curtain Construction

Curtains shall be fabricated from steel sheets conforming to ASTM A 446/A 446M, Grade A, or to ASTM A 526/A 526M, with the additional requirement of a minimum yield point of 33,000 psi. 228 Megapascal. Sheets shall be galvanized in accordance with ASTM A 525, G90. ASTM A 525M.

Doors shall be fabricated from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Slats shall be continuous without splices for the width of the door.

[Doors shall be provided with thermal insulation on interior surface of slats.]

For doors not exceeding 14 feet 4270 millimeter in width, slats shall be: [curved-profile design, with a crown depth not less than 0.75 inch, 19 millimeter, a center-to-center width not more than 2.25 inches, 57.1 millimeter and not less than a 0.0478-inch 1.21 millimeter uncoated thickness.] [flat-profile design, with a depth not less than 0.625 inch, 15.9 millimeter, a center-to-center width not more than 2.75 inches, 69.9 millimeter, and not less than a 0.0478-inch 1.21 millimeter uncoated thickness.]

For doors not exceeding 18 feet 5490 millimeter in width, slats shall be: [curved-profile design, with a crown depth not less than 0.875 inch, 22.2 millimeter, a center-to-center width not more than 3.0 inches, 75 millimeter, and not less than a 0.0478-inch 1.21 millimeter uncoated thickness.] [flat-profile design, with a depth not less than 0.75 inch, 19 millimeter, a center-to-center width not more than 2.75 inches, 69.9 millimeter, and not less than a 0.0478-inch 1.21 millimeter uncoated thickness.]

For doors not exceeding 25 feet 7620 millimeter in width, slats shall be: [curved-profile design, with a crown depth not less than 0.875 inch, 22.2



millimeter, a center-to-center width not more than 3.0 inches, 75 millimeter, and not less than a 0.0598-inch 1.51 millimeter uncoated thickness.] [flat-profile design, with a depth not less than 0.75 inch, 19 millimeter, a center-to-center width not more than 2.75 inches, 69.9 millimeter, and not less than a 0.0598-inch 1.51 millimeter uncoated thickness.]

For doors exceeding 25 feet 7620 millimeter in width, the door manufacturer's literature should be consulted.

#### 2.1.2 Curtain Bottom Bar

Curtain bottom bars shall be pairs of angles not less than 2.0 by 2.0 inches by 0.188 inch. 50 by 50 millimeter by 4.8 millimeter. Angles shall be steel conforming to ASTM A 36/A 36M. Angles and fasteners shall be galvanized in accordance with ASTM A 525, G90. ASTM A 525M. Welds and abrasions shall be coated with paint conforming to ASTM A 780.

#### 2.1.3 Vision Panels

\*\*\*\*\*  
**NOTE: Drawings must indicate the size and location  
of vision panels.**  
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Vision panels shall be as indicated, complete with acrylic glazing panels and set in neoprene channel in a galvanized-steel frame not less than 0.0359-inch 0.91 millimeter uncoated thickness. Acrylic glazing panels shall be 0.250-inch 6.4 millimeter thick cast thermoplastic methyl methacrylate flat glazing sheets with a smooth mirror finish.

#### 2.1.4 Wind Locks

Wind locks shall be cast steel conforming to ASTM A 27/A 27M, Grade B. Locks shall be galvanized in accordance with ASTM A 525, G90, ASTM A 525M, and secured to the curtain slats. A wind lock shall be provided on every other curtain slat.

#### 2.1.5 Weatherstripping

Weatherstripping for door heads shall be 1/8-inch 3.2 millimeter thick sheet natural rubber or neoprene rubber air baffles secured to the insides of hoods with galvanized-steel fasteners through continuous galvanized-steel pressure bars at least 5/8-inch 15.9 millimeter wide and 1/8-inch 3.2 millimeter thick.

Weatherstripping for door-jamb guides shall be 1/8-inch 3.2 millimeter thick strip natural rubber or neoprene rubber secured to the exterior sides of jamb guides with galvanized-steel fasteners through continuous galvanized-steel pressure bars at least 5/8-inch 15.9 millimeter wide and 1/8-inch 3.2 millimeter thick.

Bottom astragals shall be 1/8-inch 3.2 millimeter thick sheet natural rubber or neoprene rubber secured to the bottom bars.

Weatherstripping and astragals shall be natural rubber or neoprene rubber conforming to ASTM D 2000.

## 2.2 HARDWARE

### 2.2.1 Curtain Jamb Guides

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**NOTE: Drawings must indicate jamb-guide anchorage details.**  
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Curtain jamb guides shall be fabricated from a combination of steel angles of sufficient size to retain the curtain against the specified wind loadings. Guides shall be fabricated from rolled structural-quality carbon-steel angles conforming to ASTM A 36/A 36M. Guide assembly shall be galvanized in accordance with ASTM A 525, G90. ASTM A 525M. Bolt holes shall be slotted for track adjustment. Welds and abrasions shall be coated with paint conforming to ASTM A 780.

### 2.2.2 Equipment Supports

Door-operating equipment supports shall be fabricated from steel shapes and plates conforming to ASTM A 36/A 36M, galvanized in accordance with ASTM A 525, G90. ASTM A 525M. Shapes and plates shall be sized in accordance with the manufacturer's standard practices for the size, weight, and type of door installation.

### 2.2.3 Threaded Fasteners

Threaded fasteners shall consist of unfinished low-carbon steel bolts and nuts conforming to ASTM A 307, Grade A, ASTM F 568M, galvanized per ASTM A 153/A 153M, Table 1.

### 2.2.4 Locks and Latches

Manually operated push-up doors shall have galvanized-steel lifting handles on each side of the door and shall be complete with a cylinder lock and locking device.

Locking assembly shall consist of a keyed cylinder lock, a spring-loaded dead bolt, a chrome operating handle, a cam plate, and lock bars with adjustable guides to engage through slots in the track.

[Doors shall have the manufacturer's standard five-pin tumbler locks keyed as directed by the Contracting Officer.]

[Doors shall have seven-pin tumbler locks with temporary construction cores which shall be removed when directed by the Contracting Officer. Security cores will be installed by the Government prior to acceptance of the work.]

## 2.3 COUNTERBALANCING MECHANISM

Doors shall be counterbalanced by an adjustable, steel, helical torsion spring mounted around a steel shaft in a spring barrel and connected to the door curtain with the required barrel rings.

### 2.3.1 Brackets

Mounting brackets shall be the manufacturer's standard with one located at each end of the counterbalance barrel. Brackets shall be gray cast iron conforming to ASTM A 48 ASTM A 48M.

### 2.3.2 Hoods

Hoods shall be fabricated from steel sheets conforming to ASTM A 446/A 446M, Grade A, or to ASTM A 526/A 526M, with the additional requirement of a minimum yield strength of 33,000 psi. 227.5 Megapascal. Sheets shall be galvanized in accordance with ASTM A 525, G90. ASTM A 525M. Material shall have an uncoated thickness of not less than 0.0299 inch. 0.76 millimeter. Hoods shall be reinforced to prevent hood deflection.

### 2.3.3 Counterbalance Barrels

Counterbalance-barrel components shall be as follows:

Spring barrels shall be hot-formed structural-quality carbon-steel, welded or seamless pipe conforming to ASTM A 53, Type E or S, Grade A, with the steel yield point and design stresses conforming to ASTM A 36/A 36M. Pipe shall be of sufficient diameter and wall thickness to limit deflection to a maximum of 1/360 of the span. Barrels shall be hot-dip galvanized, inside and outside, in conformance with ASTM A 525, G90. ASTM A 525M.

Counterbalance springs shall be oil-tempered helical steel springs designed with a safety factor of not less than 4. Springs shall be sized to counterbalance the weight of the curtain at any point of its travel, and shall be capable of being adjusted to counterbalance not less than 125 percent of the normal curtain load. Spring adjustment shall be arranged in such a way that the curtain need not be raised or lowered to secure the adjustment.

Counterbalance shafts shall be case-hardened steel of the proper size to hold the fixed ends of the spring and carry the torsional load of the spring.

Barrel plugs shall be fabricated from cast steel machined to fit the ends of the barrel. Plugs shall secure the ends of the spring to the barrel and the shaft. Plugs shall be galvanized in conformance with ASTM A 525, G90. ASTM A 525M.

Barrel rings shall be fabricated from malleable iron of the proper involute shape to coil the curtain in a uniformly increasing diameter.

Shaft bearings shall be factory-sealed ball bearings conforming to FS

FF-B-171 and of the proper size for load and shaft diameters.

## 2.4 MANUAL DOOR OPERATORS

### 2.4.1 Manual Push-Up Door Operators

Door operators shall consist of lifting handles, locks, and latches. Counterbalance mechanisms shall be adjusted so that the required lift or pull for operation does not exceed 25 pounds. 11 kilogram. Operating mechanisms shall be designed so that the curtain can be stopped at any point in its upward or downward travel and will remain in that position until pushed to the fully open or closed position.

### 2.4.2 Manual Chain-Hoist Door Operators

Door operators shall consist of an endless steel hand chain, chain-pocket wheel and guard, and a geared reduction unit of at least a 3 to 1 ratio. Required pull for operation shall not exceed 35 pounds. 16 kilogram.

Chain hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point in its upward or downward travel and to remain in that position until moved to the fully open or closed position.

Hand chains shall be cadmium-plated alloy steel conforming to ASME B29.11M. Yield point of the chain shall be at least three times the required hand-chain pull.

Chain-sprocket wheels shall be cast iron conforming to ASTM A 48 ASTM A 48M.

### 2.4.3 Manual Crank-Hoist Door Operators

Door operators shall consist of wall-mounted cranks and crank gear boxes, steel crank drive shaft, and a geared reduction unit of at least a 3 to 1 ratio. Required lift or pull for operation shall not exceed 35 pounds. 16 kilogram.

Crank hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point in its upward or downward travel and remain in that position until moved to the fully open or closed position.

Driving gears shall be steel castings with machine-cut teeth and with keys and keyways for mounting on shafts.

Bearings shall be factory-sealed ball bearings conforming to FS FF-B-171 and of the proper size for load and shaft diameters.

Drive shafts shall be cold-rolled, polished steel.

Gear boxes shall be oiltight, fabricated from wrought iron, with a design suitable for mounting on wall or curtain track guides.

## 2.5 ELECTRIC DOOR OPERATORS

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**NOTE: Delete the paragraph heading and the following paragraphs if electric door operation is not required.**

**Refer to Division 16, "Electrical," for electrical requirements.**

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Electrical wiring shall conform to the applicable requirements of Section 16145, "Standard Wiring Systems."

Door operator controls shall conform to the applicable requirements of Section 16286, "Overcurrent Protective Devices."

Electric door-operator assemblies shall be the sizes and capacities recommended and provided by the door manufacturer for specified doors. Assemblies shall be complete with electric motors and factory-prewired motor controls, gear reduction units, solenoid-operated brakes, clutches, remote-control stations, manual or automatic control devices, and control of stations and accessories as required for proper operation of the doors.

Operators shall be so designed that motors may be removed without disturbing the limit-switch adjustment and without affecting the emergency auxiliary operators.

A manual operator of crank-gear or chain-gear mechanisms with a release clutch shall be provided to permit manual operation of doors in case of power failure. Emergency manual operator shall be so arranged that it may be put into and out of operation from floor level, and its use shall not affect the adjustment of the limit switches. An electrical or mechanical device shall be provided which will automatically disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

#### 2.5.1 Door-Operator Types

Door operators shall be [wall-mounted units] [counterbalancing bracket-mounted units] consisting of an electric motor, a worm-gear drive from the motor to the reduction gear box, a chain or worm-gear drive from the reduction gear box to the gear wheel mounted on the counterbalance shaft, and a quick-clutch disconnect release for manual operation. Motor, clutch, and drive assembly shall be the horsepower wattage rating and design determined by the door manufacturer for the size of the door and as specified.

#### 2.5.2 Motors

Motors shall be the high-starting-torque, reversible, constant-duty electrical type with overload protection. Motors shall be of sufficient torque and horsepower wattage to move the door in either direction from any position and produce a door-travel speed of not less than 8 nor more than 12 inches 0.2 nor more than 0.3 meter per second without exceeding the horsepower wattage rating.

Motors shall conform to NEMA MG 1 and to the requirements specified.

Fractional horsepower wattage motors up to 1/2 horsepower 375 watts shall be single-phase, 115-volt, 60-hertz, or 115/230-volt, 60-hertz. A dual voltage rating may be provided at the option of the Contractor.

Motors 1/2 horsepower 375 watts and larger shall be three-phase, 230/460-volt, 60-hertz.

Motor frame sizes shall conform to NEMA MG 1.

[Motor enclosures shall be open drip-proof and shall be certified for continuous operation at full nameplate power output in an ambient temperature of 104 degrees F. 40 degrees C.]

[Motor enclosures shall be totally enclosed nonventilated or fan-cooled enclosures certified for continuous operation at full nameplate power output in an ambient temperature of 104 degrees F. 40 degrees C. Enclosures shall be fitted with plugged drains.]

[Explosionproof motors shall be certified for continuous operation at full nameplate power output in an ambient temperature of 104 degrees F. 40 degrees C. Enclosures shall be fitted with UL-approved drains and breathers. Explosionproof motors shall be certified and labeled to indicate conformance to the following:

[UL 674, Class I, Groups C and D]

[UL 674, Class II, Groups F and G]]

#### 2.5.3 Motor Bearings

Bearings shall be bronze-sleeve or heavy-duty ball or roller antifriction type with full provisions for the type of thrust imposed by the specific duty load.

Bearings in motors less than 1/2 horsepower 375 watts shall be prelubricated and factory sealed.

Motors coupled to worm-gear reduction units shall be equipped with either ball or roller bearings.

Bearings in motors 1/2 horsepower 375 watts or larger shall be equipped with lubrication service fittings. Lubrication fittings shall be fitted with color-coded plastic or metal dust caps.

In any motor, bearings that are lubricated at the factory for extended duty periods shall not need to be lubricated for a given number of operating hours. An appropriate tag or label on the motor shall display this information.

#### 2.5.4 Motor Starters, Controls, and Enclosures

Each door motor shall have a factory-wired, unfused, disconnect switch; a

reversing, across-the-line magnetic starter with thermal overload protection; 120-volt operating coils with a control transformer limit switch; and a safety interlock assembled in a NEMA ICS 6 type enclosure as specified herein.

Adjustable switches, electrically interlocked with the motor controls and set to stop the door automatically at the fully open and fully closed position, shall be provided.

#### 2.5.5 Control Enclosures

Control enclosures shall conform to NEMA ICS 6 for [general purpose NEMA Type 1.] [oiltight and dusttight NEMA Type 13.] [explosionproof, NEMA Type 7, group as indicated.] [explosionproof NEMA Type 9, group as indicated.]

#### 2.5.6 Transformer

Starters with 230/460 to 115 volt control transformers with one secondary fuse shall be provided when it is required to reduce the voltage on control circuits to 120 volts or less. Transformers shall conform to NEMA ST 1.

#### 2.5.7 Safety-Edge Device

Each door shall be provided with a pneumatic safety device extending the full width of the door and located within a U-section neoprene or rubber astragal mounted on the bottom rail of the bottom door section. Device shall immediately stop and reverse the door upon contact with an obstruction in the door opening during downward travel and shall cause the door to return to full-open position. Safety device shall not be a substitute for a limit switch.

Safety device shall be connected to the control circuit through a retracting safety cord and reel.

#### 2.5.8 Remote-Control Stations

Interior remote-control stations shall be full-guarded, momentary-contact three-button, heavy-duty, surface-mounted NEMA ICS 6 type enclosures as specified. Buttons shall be marked "OPEN," "CLOSE," and "STOP." The "CLOSE" button shall be the type requiring a constant pressure to maintain the closing motion of the door. When the door is in motion and the "STOP" button is pressed, the door shall stop instantly and remain in the stopped position; from the stopped position, the door may then be operated in either direction.

Exterior control stations shall be full-guarded, momentary-contact three-button standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosures, key-operated, with the same operating functions as specified herein for interior remote-control stations.

#### 2.5.9 Speed-Reduction Units

Speed-reduction units shall consist of hardened-steel worm and bronze worm gear assemblies running in oil or grease and encased in a sealed casing,

coupled to the motor through a flexible coupling. Drive shafts shall rotate on ball- or roller-bearing assemblies that are integral with the unit.

Minimum ratings of speed reduction units shall be in accordance with AGMA provisions for class of service.

Worm gears shall be ground to provide accurate thread form; all other types of gearing shall have machined teeth. All gears shall be surface hardened.

Bearings shall be the antifriction type equipped with oil seals.

#### 2.5.10 Chain Drives

Roller chains shall be power-transmission series steel roller type conforming to ASME B29.1M, with a minimum safety factor of 10 times the design load.

Roller-chain side bars, rollers, pins, and bushings shall be heat-treated or otherwise hardened.

Chain sprockets shall be high-carbon steel with machine-cut hardened teeth, finished bore and keyseat, and hollow-head setscrews.

#### 2.5.11 Brakes

Brakes shall be internally expanding 360-degree shoe brakes or shoe and drum brakes, solenoid-operated and electrically interlocked to the control circuit to set automatically when power is interrupted.

#### 2.5.12 Clutches

Clutches shall be the 4-inch 100 millimeter diameter, multiple face, externally adjustable friction type or adjustable centrifugal type.

### 2.6 FIRE-RATED DOORS

Fire doors shall be the dimension, fire rating, and operating type indicated and shall consist of interlocking hot-dip galvanized steel slats, a bottom bar, wall guides, counterbalancing, and an automatic mechanism. Doors with electric operators shall be designed so that the electric assembly does not interfere with fire-release devices.

[Door manufacturer's standard interconnecting fusible links shall be provided for doors on both sides of a wall.]

#### 2.6.1 Fire Ratings

Doors shall meet the applicable requirements of ASTM E 152 for the following rating:

[Doors shall be Class A, 3-hour rated.]

[Doors shall be Class B, 1-1/2-hour rated.]



[Doors shall be Class C, 3/4-hour rated.]

[Doors shall be Class D, 1-1/2-hour rated.]

## 2.7 SURFACE FINISHING

Zinc-coated steel materials shall be chemically cleaned, rinsed, given a zinc-phosphate conversion coating, rinsed with cold water, and then sealed with a chromic-acid rinse in accordance with FS TT-C-490, Method III, Type I. Minimum weight of the pretreatment coating shall be not less than 150 milligrams per square foot. 1.6 gram per square meter.

[Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat of paint applied to both faces of the door after forming.]

[Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat and an enamel finish coat applied to the exterior face after forming.]

## PART 3 EXECUTION

### 3.1 GENERAL

Doors, tracks, and operating equipment shall be installed complete with specified preparatory framing, jamb and head mold stops, anchors, inserts, hangers, and equipment supports in accordance with approved drawings, manufacturer's printed instructions, and as specified.

Door guide-track assembly shall be fastened to steel or wood framing with 1/2-inch M13 galvanized machine bolts or lag screws, not more than 24 inches 600 millimeter on center, and erected plumb and true to a vertical alignment with not more than 1/8 inch 3.2 millimeter deviation in 20 feet. 6100 millimeter.

[Fire doors shall be installed in accordance with NFPA 80 and the manufacturer's standard procedure for the fire rating and type of door operation indicated.]

### 3.2 WOOD FRAMING

\*\*\*\*\*  
**NOTE: Delete the paragraph heading and the  
following paragraphs if wood framing and blocking to  
receive track and door equipment is not required.**  
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Wood framing and blocking members for rolling doors shall be Southern yellow pine, SPIB Grade No. 2 dimension lumber, West Coast hemlock, or Coast-region Douglas fir, WCLIB construction light framing grade, 2 by 6 inch. 50 by 150 millimeter.

Lumber shall be pressure-treated in accordance with FS TT-W-571 or AWPB LP 2

with CCA-A preservative (minimum retention of 0.25 pound per cubic foot (pcf) 4 kilogram per cubic meter) or FCAP preservative (minimum retention of 0.22 pcf 3.5 kilogram per cubic meter). Each piece of lumber shall be stamped to indicate the point of treatment, pressure treatment, and amount of retention.

Wood framing and blocking to receive track and door operating equipment shall be anchored with 1/2-inch M13 diameter anchor bolts or expansion sleeves and lag bolts spaced not more than 3 feet 900 millimeter on center. Bolted fasteners shall be countersunk flush with the surface of the wood. Washers shall be provided for bolt heads or nuts in contact with wood.

Framing shall be erected plumb and rigid, with wood shims inserted where required to adjust the face of the framing to a true and even surface. Side casings shall extend to the ceiling or to the minimum headroom height of the door.

### 3.3 STEEL FRAMING

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**NOTE: Delete the paragraph title and the following paragraph if the door-guide track is not attached to steel members at door openings.**

**Steel framing, shapes, and sizes to receive door jambs at door openings should be as specified in Section 05500, "Metal Fabrications."**

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Steel framing at jambs and heads of door openings shall be plumb, true, and securely anchored in place. Vertical members shall be plumb, with a deviation of not more than 1/16 inch in 20 feet. 1.5 in 6100 millimeter. Inside faces of steel jambs shall extend to the ceiling or to the minimum headroom height of the door.

### 3.4 ACCEPTANCE PROVISIONS

After installation, doors, track, and operating equipment will be examined and tested by the Government for general operation, for operation against the specified wind pressure, and for resistance to weather.

Doors that fail the required tests shall be adjusted and retested. Doors that have been adjusted and which fail subsequent tests shall be removed and replaced with new doors. New doors shall be tested and adjusted at no additional cost to the Government.

#### 3.4.1 Maintenance and Adjustment

Not more than 90 days after completion and acceptance of the project, the Contractor shall examine, lubricate, test, and re-adjust doors as required for proper operation.

-- End of Section --